Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Inquiry Regarding Carrier Current Systems Including Broadband over Power Line Systems By W. Lee McVey, P.E. To: The Commission	)	**ET Docket No. 03-104**

REPLY TO COMMENTS OF UPLC

The United Power Line Council

1. UPLC is, by its own definition, an alliance of electric power utilities and vendors involved in the development of BPL.[1]

2. UPLC was formed, and is moderated by the United Telecom Council, (UTC) the national association for power utility telecommunications, and as an entity, is most knowledgeable as to electric utility telecommunications equipment, configuration and operation in the United States. Power utility inter-facility telecommunications media

[1] Comments of UPLC, Introduction, P. 1. (July 7, 2003)

include multiplexed microwave, fiber optic and wire lines, and in some cases, older, very low frequency power line carrier systems.

A. Short Propagation Distance A Problem

3. Mr. Brett Kilbourne, spokesperson for both the UPLC and the UTC, has stated that the range of Access BPL will be less than a mile.[2] Mr. Kilbourne did not state whether the limitation applies to overhead, wide-spaced bare conductors or underground cables or to both configurations. Nor did he state whether this conclusion was formed from experimental operation or predicted analytically. The Pacific Gas and Electric Company in the 1970s experimented with very low frequency PLC impressed upon underground cables. As stated in my comments to this proceeding, those signals were capable of only propagating a very short distance, and the concept was abandoned.

4. Most electric utility medium voltage distribution feeder circuits are typically 5 to 15 miles in overall length from the source substation. As such, Mr. Kilbourne's statement would mean that many, separate and distinct bi-directional repeater units would have to be employed on each feeder circuit. As a result, throughput speeds would be greatly diminished, perhaps to the point of making the feasibility of BPL questionable. Mr. Kilbourne, in fact, acknowledges this: "Repeating the signal will increase the range, but it increases the costs and the latency of the service and constrains the bandwidth due to frequency use limitations."[3] In addition, long distribution lines most often employ several sets of switched or fixed capacitor banks, which would effectively appear as a

[2] *Ibid,* at ¶D., P.6
[3] *Ibid,* at ¶D, P.6

short circuit to BPL signals. Attempts to insert series inductance to block the attenuation would interfere with operation of the capacitors and may result in power system series resonance or stability problems. In any case, it is reasonable to expect that typical distribution lines would employ one or two capacitor banks along their lengths. Unpredictability of when capacitors will be on or off would create significant changes in BPL signal level requirements, causing either excessive or insufficient levels, depending on capacitor status when signal levels were adjusted. As explained in my previously submitted comments in this proceeding, propagation along underground medium voltage cables would be very difficult, due to the geometry of the coaxial power cable. A lossy, carbon impregnated layer surrounding the center conductor, designed to reduce the maximum electric field strength inside the cable insulation would greatly attenuate the BPL signal due to the skin effect. Also, power system configuration is not at all constant over time. Besides capacitor state changes, sections of distribution feeder lines are often transferred from one source to another. This can occur on a seasonal basis, or as a result of a system component failure to restore service more promptly. In fact, sometimes transfers are made to an entirely different substation, making totally impractical the use of one dedicated medium voltage feeder route from a distant source substation to a given customer.

5. Distribution feeder circuits are not like a point to point telecommunications circuit. They contain many branches, loops upon themselves and multiple points of connection to adjoining circuits, should switching be necessary. Routing of a BPL signal from a single source at the beginning of the distribution feeder would be complicated, and even subject, in some cases, to parallel paths or network configurations, which would make two-way

repeating of BPL signals difficult, at best.

B. Extensive Power Utility Fiber Optic Networks

6. In ¶ B., Page 4, Mr. Kilbourne states "Utilities can also use BPL to extend the reach of their fiber optic backbone networks, which have untapped capacity that can be used to aggregate and route traffic to the Internet and provide such access to areas where it does not now exist."

7. In FCC 03-105, ¶19, the Commission relied upon statements from an electric utility member of the IEEE Power System Relaying Committee, when it concluded that "While it appears that other techniques could be used to control the power grid, we find that the utility companies have come to rely on PLC systems for monitoring and control of the power grid, and that the alternatives *(such as in-place fiber optic cables and multiplexed microwave)* suggested by McVey and others may not be as effective, and would be costly." Apparently, the IEEE Power System Relaying Committee spokesperson, Mr. Simon, in his Reply to Comments in Docket 02-98, filed August 12, 2002, did not fully understand the scope of fiber optic backbone system installation in his industry as stated by Mr. Kilbourne of UTC/UPLC. How, then, can it be too expensive on one hand to utilize fiber optic pathways to replace archaic, on-off PLC systems, if fiber optics are already so robust, and widely used for utility operations, that utilities are offering their surplus fiber optic capacity to convey high speed data to and from BPL systems?

8. Mr. Kilbourne's statements clearly document the existence of an extensive power-

utility-owned fiber optic system that is already being used to securely and effectively control, operate and protect the integrity of our national power supply. It is perhaps fortunate that Dockets 02-98 and 03-104 have come before the Commission at nearly the same time as they have provided a unique opportunity for the review and audit of the accuracy of commentary submitted to the Commission in these two proceedings.

C. Last Mile Access

9. In his comments, Mr. Kilbourne refers to BPL as "high bandwidth, last mile access." Strictly interpreted, he implies that the effective range of BPL is roughly one mile and implies one zone, not the multiple layers of BPL two-way, full duplex repeaters that would be required to communicate with source substations solely on metallic conductor paths. As such, some other form of two-way communication must, then, be employed to carry the information to the 'last mile.'

10. If, for example, a multi-fiber, fiber optic bundle were to be employed to bring high speed service to the 'last mile,' why, then, should it not be employed to bring it another 10 to 20% of the distance from a substation to the last distribution transformer? Or, better yet, directly to individual residential customers?

D. Legacy VLF PLC Systems

11. Mr. Kilbourne's inclusion of a reference to existing PLC systems expresses little doubt that existing PLC could not adequately coexist with Access BPL. But, since

transmission line lengths where PLC is employed may be 50 miles or more between terminals, it is understandable why that BPL should not replace VLF PLC; or other medium-to-long distance utility telecommunication options. Ironically, Mr. Kilbourne states that he envisions Homeland Security applications for BPL.[4] But, in virtually the same breath, he claims that VLF PLC media needs to continue to exist or co-exist with BPL, where still being used. Insistence on the retention of a medium that has been proven to be insecure and potentially vulnerable to nefarious acts is simply without any measure of common sense.

12. Since VLF PLC has been recognized as a very simplistic and non-secure medium, most utilities have long ago switched critical control and protection intercommunication to fiber optic backbone systems or other secure and reliable telecommunications media. Especially since such media have been installed in order to otherwise monitor and control power system operation. Since traditional VLF PLC is simply a carrier, no carrier scheme, it cannot be used for anything more than a simple change of state for each PLC channel.

13. In addition, in FCC 03-105, the Commission assumed that PLC was and is used for monitoring of the power system. Since it can only respond to or effect one state change per channel, other, more sophisticated media are being used to monitor analog parameters and to monitor and control equipment states. Supervisory Control and Data Acquisition systems, as they are called, that perform such functions, require relatively high speed data connections between control, data, analog points and master units and most often employ

[4] *Ibid.*¶ E., P.6

leased telco lines, fiber optic cables, multiplexed microwave or in some cases, point to point radio modem devices. SCADA systems have been widely deployed in the electric utility industry since the early 1980s and have the capability to monitor and control thousands of points of interest in a typical utility substation.

E. Conclusions

14. On its own admission, the electric utility industry has an already-installed, extensive fiber optic backbone telecommunication system which it proposes to use, in part, to provide high speed Internet access and other services to its customers. UPLC/UTC, representing the utility industry, has stated that BPL is a 'last mile' concept. If it is truly only a last mile concept, then existing electric utility fiber optic systems must be extended to the last mile to interconnect with BPL to achieve satisfactory throughput. Since technologies exist to provide both electrical conductor and fiber optic cores in one bundled, stranded cable, there is little reason why fiber core power cables could not be extended the entire length of distribution feeders directly to the customer. Or, at least to distribution transformers or other strategic points where a proven, high speed wireless technology, such as IEEE 802.11, could be employed for the last 100 feet to supply multiple customers with high speed two way Internet and perhaps even other services which are now unavailable outside urban areas. Also, with elevations of 30 to 45 feet above average terrain at pole-top, and wireless hub devices geographically centered, perhaps several rural customers could be served from one wireless hub overhead location. Power system reconfiguration obstacles for fiber optic bundles could be

resolved by simply bypassing fiber optic core tubes around electrical switches, allowing rearrangement of power flow without disrupting data service routing. Or, alternatively, installation of fiber core conductor as overhead common neutral would avoid switches altogether.

15. The above reply comments are timely filed via ECFS and are submitted in accordance with 47 CFR § 1.415. They have been telefaxed to Mr. Kilbourne at (202) 872-1331 at his UPLC/UTC offices in Washington, D.C. on July 28, 2003.

Respectfully Submitted,

/s/

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